Claims

What is claimed is:

1. A fiber optic array switch comprising:

first and second substrates, each substrate comprising:

a front and an opposing rear face, the front faces of each substrate disposed in facing relation to one another;

at least one fiber-retaining channel disposed therein extending from the front face to the rear face; and

at least a first groove disposed along a longitudinal axis within the front face; and

at least one friction reducing element disposed within the first grooves of the first and second substrates, so that the first substrate may translate with respect to the second substrate along the direction of the longitudinal axis of the groove of the first substrate.

2. The switch according to claim 1 wherein the grooves are in registration.

3. The switch according to claim 1 wherein the grooves have the same length.

4. The switch according to claim 1 wherein the longitudinal axis of the first groove of the first substrate is orthogonal to the longitudinal axis of the first groove of the second substrate whereby the first substrate may translate with respect to the second substrate in a direction orthogonal to the longitudinal axis of the first groove of the first substrate.

5. The switch according to claim 1 wherein at least one groove of the first substrate is dimensioned to match a selected dimension of the friction reducing element so that the friction reducing element is confined within the groove of the first substrate.

6. The switch according to claim 1 wherein at least one of the grooves comprises at least one detent dimensioned to at least temporarily retain the friction reducing element at a selected position.

7. The switch according to claim 6 wherein the at least one fiber-retaining channel of the first substrate comprises a plurality of channels arranged in a preselected number of rows and wherein the number of detents in the groove of the first substrate is correlated to the preselected number of rows.

8. The switch according to claim 7 wherein the detents are spaced relative to the spacing among the rows of channels.

9. The switch according to claim 8 wherein the at least one fiber-retaining channel of the second substrate comprises a plurality of channels arranged in a preselected number of rows and wherein the number of detents in the groove of the second substrate is correlated to the preselected number of rows of channels of the second substrate.

10. The switch according to claim 9 wherein the detents in the groove of the second substrate are spaced relative to the spacing among the rows of channels of the second substrate, so that locating the friction reducing element in respective detents of the first and second substrates provides registration between respective channels of the first and second substrates.

11. The switch according to claim 1 wherein the first substrate comprises a second groove disposed within the front face of the first substrate.

12. The switch according to claim 11 comprising a second friction reducing element disposed within the second groove.

13. The switch according to claim 12 wherein the second groove is dimensioned to match a selected dimension of the second friction reducing element so that the second friction reducing element is confined within the second groove.

14. The switch according to claim 11 wherein the second groove is parallel to the first groove of the first substrate.

15. The switch according to claim 11 wherein the second groove is orthogonal to the first groove of the first substrate.

16. The switch according to claim 15 wherein the second groove communicates with the first groove of the first substrate.

17. The switch according to claim 11 wherein the second substrate comprises a second groove disposed within the front face of the second substrate.

18. The switch according to claim 17 wherein the second grooves of the first and second substrate are in registration and wherein the switch comprises a second friction reducing element disposed in the second grooves.

19. The switch according to claim 18 wherein the first and second substrates each comprise a third groove having first and second ends, the first end in communication with the respective first groove and the second end in communication with the respective second groove.

20. The switch according to claim 19 wherein the third grooves are perpendicular to the respective first grooves.

21. The switch according to claim 18 wherein the first grooves are in at least partial registration, and wherein the first groove of the first substrate is dimensioned to a selected dimension of the first friction reducing element so that the first friction reducing element does not translate within first groove of the first substrate, and wherein the second grooves are at least in partial registration and the second groove of the second substrate is dimensioned to a selected dimension of the second friction reducing element so that the second friction reducing element does not translate within the second groove of the second substrate.

22. The switch according to claim 11 wherein the at least one channel is disposed between the first and second grooves of the first substrate.

23. The switch according to claim 1 wherein the at least one channel of the first substrate comprises a linear array of channels.

24. The switch according to claim 23 wherein the linear array comprises a basechip having base grooves formed therein to provide the channels.

25. The switch according to claim 24 wherein the basechip is integrally formed with the first substrate.

26. The switch according to claim 24 wherein the linear array comprises a lidchip having lid grooves formed therein, and wherein the lidchip is positioned relative to the basechip so that the base grooves and the lid grooves are registered relative to one another to provide the channels.

27. The switch according to claim 26 wherein the basechip includes a probe and the lidchip includes a complementary socket for registering the basechip to the lidchip.

28. The switch according to claim 1 wherein the at least one channel of the first and second substrates each comprise a plurality of channels disposed in a two-dimensional array of channels.

29. The switch according to claim 1 wherein the at least one channel of the first substrate comprises a plurality of channels disposed in a two-dimensional array of channels.

30. The switch according to claim 29 wherein the two-dimensional array of channels comprises a plurality of linear arrays of channels arranged to provide the two-dimensional array.

31. The switch according to claim 30 wherein at least one of the plurality of linear arrays comprises a basechip having base grooves formed therein to provide the channels.

32. The switch according to claim 31 wherein the basechip is integrally formed with the first substrate.

33. The switch according to claim 32 wherein the linear array comprises a lidchip having lid grooves formed therein, and wherein the lidchip is positioned relative to the basechip so that the base grooves and lid grooves are registered to one another to provide the channels.

34. The switch according to claim 33 wherein at least one of the basechip and the lidchip includes a probe and at least one of the other basechip and lidchip includes a complementary socket for registering the basechip to the lidchip.

35. The switch according to claim 1 wherein the friction reducing element is substantially spherical.

36. The switch according to claim 1 wherein the friction reducing element is cylindrical.

37. The switch according to claim 1 wherein the friction reducing element has a circular cross-section.

38. A fiber optic array switch comprising:

a first and a second fiber array, each array having a front face, the front faces disposed in facing relation to one another;

a first groove disposed along a first path within the front face of the first array;

a second groove disposed along the front face of the second array; and

a friction-reducing element disposed in the first groove and intermediate the front face of the first and second arrays to reduce friction between the first array and the second array as the first array is displaced relative to the second array to effect switching.

39. The switch according to claim 38 wherein the friction-reducing element includes a first roller element disposed within the first groove of the first array and in contact with the front face of the second array, so that the first array may be displaced relative to the second array along the direction of the first path.

40. The switch according to claim 39 wherein the second groove is disposed in opposing relationship with the first groove to provide a single path of relative displacement between the first and second arrays.

41. The switch according to claim 40 wherein the second groove is disposed relative to the first groove to provide more than one path of relative displacement between the first and second arrays.

42. The switch according to claim 41 wherein the first and second grooves are longitudinal grooves and wherein the second path provided by the second groove intersects the first path of the first groove at a selected angle to provide at least two paths of relative displacement.

43. The switch according to claim 42 wherein the longitudinal axis of the first groove is orthogonal to the longitudinal axis of the second groove, whereby the first array may translate with respect to the second array in a direction orthogonal to the first longitudinal axis.

44. The switch according to claim 39 wherein the first and second grooves are disposed to provide two-dimensional relative displacement of the first and second arrays.

45. The switch according to claim 39 wherein the first and second grooves have the same length.

46. The switch according to claim 38 wherein the first groove is dimensioned to match a selected dimension of the roller element so that the roller element is confined within the first groove during relative displacement of the first and second array.

47. The switch according to claim 38 wherein the first groove comprises at least one detent dimensioned to temporarily hold the roller element in a certain position within the first groove to permit the first and second arrays to be aligned relative to each other.

48. The switch according to claim 47 wherein the first array comprises a plurality of fiber channels arranged in a preselected number of rows of fiber channels, and wherein the number of detents in the first groove is related to the preselected number of rows of fiber channels.

49. The switch according to claim 48 wherein the detents are spaced relative to the pitch of the rows of fiber channels.

50. The switch according to claim 48 wherein the second array comprises a plurality of fiber channels arranged in a preselected number of rows of fiber channels, and wherein the second groove cooperates with the first groove of the first array and the second groove includes at least one detent, the number of detents in the second groove related to the preselected number of rows of fiber channels in the second array.

51. The switch according to claim 50 wherein the detents in the second groove are spaced relative to the pitch of the rows of fiber channels of the second array, so that locating the roller element in respective detents of the first and second arrays provides registration between respective fiber channels of the first and second arrays.

52. The switch according to claim 39 comprising a third groove disposed within the front face of the first array.

53. The switch according to claim 52 comprising a second roller element disposed within the third groove.

54. The switch according to claim 53 wherein the third groove is dimensioned to match a selected dimension of the second roller element so that the second roller element is confined within the third groove of the first array.

55. The switch according to claim 52 wherein the third groove is parallel to the first groove.

56. The switch according to claim 52 wherein the third groove communicates with the first groove.

57. The switch according to claim 56 wherein the third groove is orthogonal to the first groove.

58. The switch according to claim 52 comprising a fourth groove disposed within the front face of the second array.

59. The switch according to claim 58 wherein the first groove of the first array and the second groove of the second array are in at least partial registration to confine the first roller element.

60. The switch according to claim 59 wherein the third groove of the first array and the fourth groove of the second array are in at least partial registration and wherein the switch comprises a second roller element disposed within the third and fourth grooves.

61. The switch according to claim 52 wherein the first array includes a fifth groove having first and second ends disposed within the front face of the first array, the first end in communication with the first groove and the second end in communication with the third groove.

62. The switch according to claim 61 wherein the second array includes a sixth groove having first and second ends disposed within the front face of the second array, the first end in communication with the second groove and the second end in communication with the fourth groove.

63. The switch according to claim 39 wherein the first array comprises a plurality of fiber channels.

64. The switch according to claim 63 wherein the fiber channels of the first array comprise a linear array of channels.

65. The switch according to claim 64 wherein the first array comprises a chip having grooves formed therein to provide the channels for holding fibers of a fiber array.

66. The switch according to claim 65 wherein the first array includes a frame and a passageway through the frame and wherein the chip is insertable into the passageway of the first array.

67. The switch according to claim 63 wherein the first array includes a frame and a passageway through the fame and wherein the first array includes grooves in the passageway to provide the fiber channels.

68. The switch according to claim 67 comprising a chip insertable into the passageway to hold the fiber in the fiber channels.

69. The switch according to claim 67 wherein the first array comprises a chip having chip grooves formed therein, the chip being insertable into the passageway so that the chip grooves may register with the grooves of the passageway to provide the fiber channels.

70. The switch according to claim 64 wherein the first array includes a frame and a passageway through the frame and wherein the first array includes a chip insertable into the passageway to hold fibers in the fiber channels and wherein the first array includes a probe on at least one of the passageway and the chip and a complementary socket on at least the other of the passageway and the chip for registering the chip within the passageway.

71. The switch according to claim 64 wherein the fiber channels of the first array comprise a two-dimensional array of channels.

72. The switch according to claim 71 wherein the two-dimensional array of channels comprises a plurality of linear arrays of channels arranged to form the two-dimensional array.

73. The switch according to claim 39 wherein the roller element is substantially spherical.

74. The switch according to claim 39 wherein the roller element is cylindrical.

75. The switch according to claim 39 comprising optical fibers disposed within the first array.

76. The switch according to claim 39 wherein the first array holds at least one optical fiber.